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[Claim(s)]

[Claim 1] The anaerobic treatment method of the organic nature waste water characterized by adding the iron ion more than Mol [compound / which is contained during drainage / sulfur] to organic nature drainage, and performing anaerobic treatment to it

[Detailed Description of the Invention]**[0001]**

[Industrial Application] This invention relates to the aversion living thing processing method of the organic nature drainage containing a little sulfur compounds, such as sulfuric acid and sulfite ion. It is related with the living thing processing method that hydrogen sulfide in the biogas which occurs in anaerobic treatment especially can be reduced simply.

[0002]

[Description of the Prior Art] Anaerobe processing is performed as the processing method of organic nature drainage, such as a sewer, human waste, and industrial waste water. The drainage containing an organic matter is contacted to anaerobic bacteria (sludge), even carbon dioxide and methane decompose, and biogas generates this anaerobic treatment. In biogas, it originates in the sulfur compound under drainage other than methane and carbon dioxide, and hydrogen sulfide is contained. Although such biogas is usually used effectively as fuel of a boiler and an incinerator for the purpose of energy recovery in many cases, its removal (desulfurization) of hydrogen sulfide in biogas is indispensable because of air pollution prevention because of corrosion control, such as incineration equipment. There are a dry method which gas is contacted to iron oxide and fixes hydrogen sulfide as the desulfurization method of biogas conventionally, wet process which contacts gas in alkali absorption liquid, etc.

[0003]

[Problem(s) to be Solved by the Invention] However, by the conventional desulfurization method, the equipment for desulfurization needed to be formed separately [anaerobic treatment equipment], and there was a problem of high cost in which problem with exchange of a bulking agent serious in a dry method out of which waste comes in wet process. This invention solves such a problem and offers the easy anaerobic treatment method of control of maintenance at low cost, without generating hydrogen sulfide.

[0004]

[Means for Solving the Problem] This invention is the anaerobic treatment method of the organic nature waste water which adds the iron ion more than Mol [compound / which is contained during drainage / sulfur] to organic nature drainage, and makes anaerobic place Michiyuki ***** it with the feature. In this invention, anaerobic treatment maintains at an anaerobic condition the drainage containing the organic nature substance which is a processed material. The anaerobic digestion which is the operation which disassembles an organic matter through an acid generation reaction and a methane generation reaction using an operation of an anaerobe, and makes the whole organic nature substance throw in and digest, High load anaerobic treatment which removes a solid and carries out anaerobic treatment of the soluble organic matter, such as the UASB method (the style sludge blanket method for tops), a fluid bed method, and a fixed floor method, is common. Moreover, a 2 Aikata style to which a 1 Aikata style which performs an acid generation reaction and a methane generation reaction by one anaerobic reaction vessel also performs both reactions by a separate reaction vessel is sufficient as anaerobic treatment.

[0005] The organic nature drainage which is the target of anaerobic treatment is drainage of a sewer, human waste, industrial waste water, etc., for example, and is drainage containing a little sulfur compounds, such as sulfuric acid ion and sulfite ion. The quantity of a sulfur compound is good in 40mg/l. or less as S preferably. It faces carrying out anaerobic treatment of such drainage, and iron ion is added to drainage. Iron salt, such as ferrous chloride, ferric chloride, the first iron of nitric acid, and the second iron of nitric acid, can be used that what is necessary is just the iron compound which **** iron ion in underwater as iron ion. Iron salt is good the raw water which flows into an anaerobic reaction vessel, and to add at the entrance of a methane fermentation tub desirably. As for the amount of addition of iron salt, 1.2-2 times the amount is [more than Mol / sulfur /, such as sulfuric acid under drainage, and sulfurous acid] preferably desirable. For example, when sulfuric acid and about 10-20 mg/L of sulfurous acid are contained as S during drainage which is the target of high load anaerobic treatment, such as the UASB method, it is Fe concentration required for addition. It becomes 17-35 or more mg/L. Anaerobic treatment of the drainage by which iron salt was added is carried out as usual.

[0006] If anaerobic treatment is performed, the reaction of acid generation and methane

generation will arise, and an organic matter will be disassembled by operation of anaerobic bacteria, but sulfuric acid ion etc. is returned to hydrogen sulfide by sulfate reduction bacteria according to the following equations in this case.

$\text{SO}_4^{2-} + \text{CH}_3\text{COO}^- \rightarrow \text{CO}_2 + \text{S}^{2-} + \text{H}_2\text{O} + \text{HCO}_3^-$ - The generated hydrogen sulfide reacts promptly with the added iron ion, and produces an iron sulfide.

$\text{Fe}^{2+} + \text{S}^{2-} \rightarrow$ The iron sulfide which carried out FeS generation adheres to sludge, it is held in a system, and hydrogen sulfide does not shift into biogas. The sludge which adhered the iron sulfide is discharged from a reaction vessel as waste sludge at arbitrary time. Thus, the content of hydrogen sulfide is remarkably reduced by the biogas which occurs in the case of anaerobic treatment, and problems, such as corrosion, are mitigable even if it uses biogas effectively.

[0007] As the ratio (Fe/S) of the iron ion added in this invention and S concentration of drainage origin is large, it is comparatively easier for the hydrogen sulfide concentration which remains to underwater [of a reaction vessel] to become low, and to be referred to as about 20-30 ppm or less as hydrogen sulfide concentration in processing gas. However, when hydrogen sulfide in processing gas tends to be reduced further and it is going to obtain the gas of high purity, the hydrogen sulfide left in gas ** can be efficiently caught by water or the water in which alkali was dissolved washing processing gas, and making the raw water of a methane generation reaction vessel circulate through the cleaning fluid. In this case, if alkaline chemicals are used for cleaning fluid and it is going to obtain high purity gas with the conventional technology although equipment and medicine cost become high a little, since the amount of alkaline chemicals becomes it is remarkable and abundant, it is far more economical [this invention]. in addition -- the amount of addition of iron salt is usually based on sulfuric acid in raw water, and the upper limit of sulfurous acid concentration -- etc. -- although more than Mol adds, a hydrogen sulfide sensor etc. can detect the hydrogen sulfide concentration in the occurring gas, the flux of the iron salt supply pump added according to the amount of detection can be changed, and the stable removal performance can also be obtained.

[0008] The Biel drainage to which high load aversion processing methods, such as UASB, are applied to especially this invention, It can burn without having a bad influence without [it is effective and economical and] the desulfurization facility as gas processing on combustion equipments, such as a boiler, when [, such as potato processing drainage,] sulfide ion concentration is comparatively low (40 or less mg/L as S). Moreover, when the sulfur compound under drainage is contained so much, the rate of the iron sulfide in sludge increases gradually, and a possibility that the amount of maintenance of the bacillus of a reaction vessel may decrease, and living thing processing may not fully progress arises.

[0009]

[Example] The influence of the iron salt concentration exerted on generating hydrogen sulfide concentration was investigated using the experimental device which consists of the UASB methane generation tub of capacity 9L (cm [in diameter / 10], and about 100cm in height), and the acid generation tub of capacity 2.5L. The ground substance was glucose + ethanol (it mixes by 3:1 as CODcr), it added ammonium chloride and monopotassium phosphate so that it might be set to 1000:10:2 by making N (nitrogen) and P (phosphorus) into CODcr:N:P, and it diluted them with tap water so that CODcr might serve as about 4000 mg/L further. The experimental device was installed in the homoiothermal interior of a room of 30-degree Centigrade, and pH added 25% of NaOH so that the inside of an acid generation tub might be set to 6.2. In the tub, Abbreviation 3L (VSS:45000 mg/L) was extracted, it was filled up with GURANYURU sludge from the real equipment which is processing the Biel drainage, and continuation operation of the operation CODcr load was carried out byd in about 8kg/m3 /. the sulfuric acid ion of about three to 5 mg/L (as S) being contained during the synthetic drainage diluted with tap water, and receiving this -- etc. -- Mol's Fe³⁺ becomes 5.2 - 8.7 mg/L. In the experiment, Run-1 (comparative example) added ferric chloride so that it might become 10 mg/L by 3 mg/L and Run-3 (EXAMPLE) about Fe, and it investigated the hydrogen sulfide concentration in generating gas additive-free and Run-2 (comparative example). The result was as follows.

	Fe ³⁺	ガス中の平均H ₂ S
Run-1	—	860 ppm
Run-2	3mg/L	310 ppm
Run-3	10mg/L	25 ppm

receiving sulfuric acid so that clearly also from the above-mentioned result -- etc. -- by making the iron ion more than Mol exist shows that shift of hydrogen sulfide to the inside of gas is controlled.

[0010]

[Effect of the Invention] According to this invention, furnishing for desulfurization becomes unnecessary, therefore since control of maintenance is also only medicine addition, it becomes easy, and desulfurization cost can also be reduced remarkably. Moreover, since the biogas after a living thing reaction is processed in the conventional desulfurization, there is a possibility that the hydrogen sulfide generated at the living thing reaction may cause activity prevention to a living thing, but since the hydrogen sulfide generated in this invention reacts with iron ion and it is detoxicated, the fear does not exist. Furthermore, when it applies to the UASB method, FeS deposits in GURANYURU and the sedimentation nature of the sludge

made into the fault of UASB is improved.

[Translation done.]